(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
30 November 2000 (30.11.2000)

PCT

(10) International Publication Number
WO 00/72555 A1

(51) International Patent Classification[7]: H04M 1/00

(21) International Application Number: PCT/US00/13788

(22) International Filing Date: 19 May 2000 (19.05.2000)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
09/316,153 21 May 1999 (21.05.1999) US

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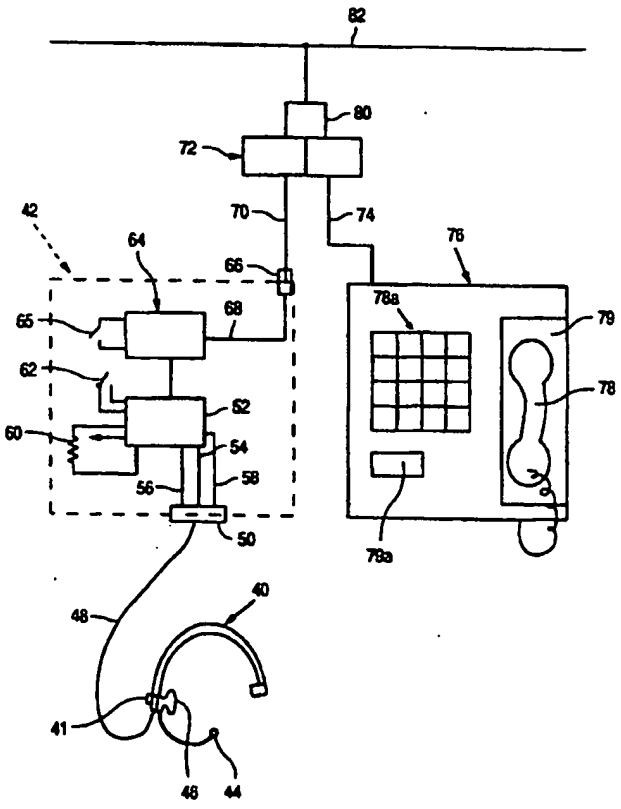
(81) Designated States *(national)*: BR, CN, KR.

Published:
— *With international search report.*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

WO 00/72555 A1

(54) Title: TELEPHONE HEADSET WITHOUT OFF-HOOK HANDSET REQUIREMENT



(57) Abstract: A telephone headset interface unit (42) is provided for coupling a telephone headset (40) and a telephone handset (78) to a telephone communication line (82) such that a user can selectively operate either the telephone headset or the telephone handset. The telephone headset interface includes an off-hook element (64) that can be actuated to either permit or prohibit communication between the telephone headset and the telephone communication line. The telephone headset may be hard wired to the telephone headset interface. The telephone headset may also be wireless. The telephone headset interface may further include a voice recognition and synthesis module that permits a user to orally dial a phone number via the telephone headset.

TELEPHONE HEADSET WITHOUT OFF-HOOK HANDSET REQUIREMENT

FIELD OF THE INVENTION

The present invention relates to telephone headsets. More particularly, the present invention relates to a telephone headset, which is interfaced with a standard telephone handset, such that the headset can be operated without removing the handset from its cradled, on-hook position.

BACKGROUND OF THE INVENTION

Telephone handsets often hinder those who work in "hands-free" environments. For example, secretaries, travel agents, and telephone salespersons often need to take notes or perform other functions with their hands while carrying on phone conversations. As can readily be appreciated, holding a telephone handset greatly reduces the productivity of a person working in one of these occupations. In response to this drawback, speaker-phones have been developed so users need not hold handsets while carrying on phone conversations. Although a speaker-phone does free a user's hands, the user experiences a lack of privacy during his telephone conversation over the speaker-phone. For example, when a user in an office receives a call through a speaker- phone, anyone in the vicinity of the speaker-phone can overhear the entire conversation between the user and the caller. In response to this drawback, telephone headsets have been developed so a user need not hold a handset, nor risk being overheard, while carrying on a "hands free" conversation.

Referring to Fig. 1, a conventional telephone handset and headset arrangement is shown. A phone 10, such as a desk-top phone, is connected into a communication line 12 through a telephone cord 14 and a telephone jack 16. A telephone handset 18 is supported on the phone 10 in a cradle area 20. The handset 18 is operatively connected to the phone 1 through a handset cord 22, interface device 24, and interface cord 26. A headset 28 is operatively connected to the phone 10 through a headset

cord 30, the interface device 24, and the interface cord 26. By this arrangement, a user can take calls through the handset 18 or through the headset 28. However, one significant drawback to the above arrangement is the need to remove the handset 18 from the cradle area 20, i.e. the on-hook position, in order to enable call receiving with the headset 28. Another significant drawback to the above arrangement is the need to remove the handset 18 from the cradle area 20 and directly operate a keypad (not shown) of the phone 10 to place an outgoing call with the headset 28. A further significant drawback to the above arrangement is the presence of the phone 10 in the audible pathway extending between the communication line 12 and the headset 28. As understood by those skilled in the art, audio signals become degraded as the signals travel through multiple communication elements. These degraded signals result in poor sound quality for the user.

Consequently, there is a continuing need for a telephone headset interface unit which permits a telephone headset to be interfaced with a standard telephone handset such that the headset can be operated without operating a telephone keypad or removing a telephone handset from its cradle. However, the applicant knows of no prior art, which overcomes all of the aforementioned drawbacks. More specifically, the following is the most relevant prior art known to the applicant.

U.S. Patent No. 5,504,812 to Vangarde is directed to a telephone headset for use with a radio telephone. The headset includes a pivoting boom and connects to the radio telephone through a cord. In use, when a user rotates the boom from a stored position to an active position, the radio telephone is placed in the off-hook position to answer the telephone call, so that a user can carry on a phone conversation without using his or her hands. In an alternative embodiment of the headset, the rotation of the boom provides a flash-hook feature.

U.S. Patent No. 5,191,602 to Regen et. al. is directed to a cellular telephone headset. A telephone headset apparatus is modularly connectable to a cellular telephone. The normal handset of the cellular phone may remain resting in its cradle even while the headset is operated. A slave unit is inserted in the path between a transceiver, which receives regular telephone signals from a network, and a wiring harness. A headset control unit is coupled to the wiring harness in place of the handset, which is instead coupled to the headset control unit. Finally, the headset is also coupled to the headset control unit. Basically, the headset control unit has as its input the received telephone signal, and a pair of branched outputs connecting to the headset and the handset, respectively. The headset control unit includes a volume control dial, and a momentary-contact push button. When depressed, the push button toggles the headset apparatus on and off.

U.S. Patent No. 5,533,105 to Brown et al. is directed to a method and apparatus for emulating a telephone with a modem and headset. An emulator circuit provides a connection means which allows a modem and a headset to emulate the functions of a telephone, thereby eliminating the need to provide a separate telephone. When placing a voice telephone call, the emulator circuit connects headset to a telephone line. When receiving an incoming telephone call, the emulator circuit connects either the headset or the modem to the telephone line.

U.S. Patent No. 5,544,243 to Papadopoulos is directed to a telephone headset interface circuit. The telephone headset interface circuit is adapted for coupling to a handset, a headset, a telephone, and telephone lines such that power is supplied to the headset from the telephone lines.

U.S. Patent No. 5,561,712 to Nishihara is directed to a hands-free phone set. The phone set includes a speaker phone unit and a hand-held remote control unit for activating the speaker phone unit.

U.S. Patent No. 5,177,784 to Hu et al. is directed to a convertible head-set telephone device and method. A remote or cordless handset is converted into a headset which is then operated by a subscriber away from the cradle of the handset.

U.S. Patent No. 5,335,313 to Douglas is directed to a complex voice-actuated, speaker-dependent control system for a hospital bed, including telephone control from a head-set. Voice commands given by a patient are transmitted through a head-set microphone. If the patient wishes to dial out on the telephone, the appropriate voice command is given, thus activating the off-hook. The patient then dials the telephone number by saying aloud each number to signal the telephone interface chip to begin dialing the requested number. Voice recognition circuitry accepts voice commands through the telephone head-set microphone and enacts electrical commands based thereon.

ADVANTAGES OF THE INVENTION

It is an advantage of the present invention to provide a telephone headset which overcomes the drawbacks of the prior art described above.

It is another advantage of the present invention to provide a telephone headset interface unit having a separate off-hook mechanism that can be directly connected to a communication line rather than indirectly connected to a communication line through a telephone unit.

These and other advantages of the present invention will become apparent to one skilled in the art in view of the figures and description of the figures given below.

SUMMARY OF THE INVENTION

Briefly stated, a telephone headset interface unit is provided for coupling a telephone headset and a telephone handset to a telephone communication line such that a user can selectively operate either the telephone headset or the telephone handset. The telephone headset interface includes an off-hook element that can be actuated to either permit

or prohibit communication between the telephone headset and the telephone communication line. The telephone headset may be hard wired to the telephone headset interface. The telephone headset may also be wireless. The telephone headset interface may further include a voice recognition module that permits the telephone headset to be voice activated.

A feature of the present invention includes a telephone headset configuration for use with a telephone handset, the telephone headset configuration including a telephone headset, and a telephone headset interface unit coupling the telephone headset and the telephone handset to a telephone communication line such that a user can selectively operate one of the telephone headset and the telephone handset to receive and transmit a plurality of calls over the telephone communication line. In other words, the user can activate one device (i.e., the telephone headset) without activating the other device (i.e., the telephone handset).

Another feature of the present invention includes a telephone headset configuration for use with a telephone handset, the telephone headset configuration including a telephone headset, and an interface means for coupling the telephone headset and the telephone handset to a telephone communication line such that the telephone headset can be operated independently from the telephone handset, the interface means including a speech recognition means positioned in an audible pathway that extends between the telephone headset and the telephone communication line, the speech recognition means for transmitting a plurality of signals in response to receipt of a series of audible signals representing the user's voice, and connection means positioned in the audible pathway between the speech recognition means and the telephone communication line, the connection means transitioning between a connect state and a disconnect state in response to the user manually actuating the connection means, the connection means permitting communication between the telephone

headset and the telephone communication line when the connection means is in the connect state, the connection means prohibiting communication between the telephone headset and the telephone communication line when said connection means is in the disconnect state.

A further feature of the present invention includes a telephone headset configuration for use with a telephone handset, the telephone headset configuration including a telephone headset, and an interface means for coupling the telephone headset and the telephone handset to a telephone communication line such that the telephone headset can be operated independently from the telephone handset, the interface means including a speech recognition means positioned in an audible pathway that extends between the telephone headset and the telephone communication line, the speech recognition means for transmitting a plurality of signals in response to receipt of a series of audible signals representing the user's voice, and connection means positioned in the audible pathway between the speech recognition means and the telephone communication line, the connection means transitioning between a connect sate and a disconnect state in response to receipt of a plurality of signals from the speech recognition means, the connection means permitting communication between the telephone headset and the telephone communication line when the connection means is in the connect state, the connection means prohibiting communication between the telephone headset and the telephone communication line when said connection means is in the disconnect state.

BRIEF DESCRIPTION OF THE DRAWINGS

The aforementioned advantages of the present invention as well as additional advantages thereof will be more clearly understood hereinafter as a result of a detailed description of a preferred embodiment of the invention when taken in conjunction with the following drawings in which:

FIG. 1 is a circuit schematic illustrating a prior art interface between a headset and a handset.

FIG. 2 is a circuit schematic of the present invention illustrating an interface between a wired handset and a wired headset.

FIG. 3 is a circuit schematic of the present invention illustrating an interface between a wired handset and a wireless headset.

FIG. 4 is a circuit schematic of the present invention illustrating an interface between a wired handset and a wired voice-recognition headset.

FIG. 5 is a circuit schematic of the present invention illustrating an interface between a wired handset and a wireless voice-recognition headset.

FIG. 6 is a circuit schematic of the present invention illustrating a preferred interface between a wired handset and the headsets shown in FIGS. 2-5.

DETAILED DESCRIPTION OF THE DRAWINGS

Referring to Fig. 2, a headset 40 and a headset interface unit 42 of the present invention are shown. The headset 40 includes an on/off button 41, a microphone 44, and a speaker 46. The headset 40 is operatively connected to the headset interface unit 42 through a cord 48 having a connector that mates with a stereo jack 50 in the headset interface unit 42. The stereo jack 50 has three connections to three conductors connected to speech network circuitry 52. A first conductor 54 is connected to the ground of the headset interface unit 42. A second conductor 56 connects the microphone 44 in the headset 40 to the speech network circuitry 52. A third conductor 58 connects the speaker 46 in the headset 40 to the speech network circuitry 52. A volume control circuit 60 is connected to the speech network circuitry 52 permitting a user to adjust the magnitude of sound heard through the speaker 46. A mute switch 62 is also connected to the speech network circuitry 52 permitting the user to temporarily interrupt signals from the microphone 44 so the

caller is unable to hear a conversation between the user and a third party. As known by those skilled in the art, the speech network circuitry 52 also contains other call processing elements, such as microprocessors, amplifiers, and the like. It is considered within the scope of the present invention to position the mute and volume control circuitry within the telephone headset 40. It is also considered within the scope of the present invention to position the on/off button 41 on the headset interface unit 42.

The speech network circuitry 52 is electrically connected to an off-hook element 64. The off-hook element 64 causes the headset interface unit 42 to go off-hook and on-hook in response to the user actuating the button 41 located on the headset 40. In operation, the user actuates the button 41 to cause the off-hook element 64 to go off-hook, thereby permitting the headset 40 to transmit and receive audio signals as discussed in further detail below. The off-hook element 64 is connected to an I/O device 66 through an internal line 68. The I/O device 66 is preferably a conventional telephone jack. A first cord 70 connects the I/O device 66 to a three way-coupler 72. A second cord 74 connects the three-way coupler 72 to a conventional telephone 76 having a handset 78 located on a cradle area 79. By this arrangement, the three-way coupler 72 connects the telephone 76 and the headset interface unit 42 to a telephone jack 80 that, in turn, is connected to a communication line 82.

During normal operation, the user receives an incoming call by removing the handset 78 from the cradle area 79 on the phone 76 and communicating through the handset 78. During "hands-free" operation, the user positions the headset 40 on his head and causes the off-hook element 64 to go off-hook, represented by the closing of a switch 65, by actuating the button 41 provided on the headset 40. This establishes an audible pathway between the communication line 82, and the microphone 44 and speaker 46 of the headset 40. The user can then communicate to the caller through the headset 40 while performing other functions with his

hands. When the call is completed the user actuates the button 41 to cause the off-hook element to go on-hook, represented by the opening of the switch 65, thereby breaking the audible pathway between the headset 40 and communication line 82. While the switch 65 is shown as positioned in the headset interface unit 42, it is considered within the scope of the present invention to position the switch 65 within the headset 40. A keypad (not shown) may be provided on the headset interface unit 42 so the user can make an outgoing call through the headset 40. To make the outgoing call the user actuates the button 41 to cause the off-hook element 64 to go off-hook thereby establishing an audible pathway between the headset 40 and communication line 82. The user then dials the outgoing number via the keypad (not shown). If no keypad is provided, the user may actuate the button 41 and remove the handset 78 from the cradle area 79. The user may then dial the outgoing number via the telephone keypad 78a. After the outgoing call is connected, the user may return the handset 78 to the cradle area 79 and continue the conversation via the headset 40. Alternatively, the user can actuate both the button 41 and a speaker button 79a, and then dial the outgoing number via the telephone keypad 78a. After the outgoing call is connected, the user may actuate the speaker button 79a again and continue the conversation via the headset 40.

Referring now to Fig. 3, a wireless headset 100 and a wireless headset interface unit 102 of the present invention are shown. The wireless headset 100 includes an on/off button 104, a microphone 106, a speaker 108, and a transceiver 110. The wireless headset 100 remotely communicates with the wireless headset interface unit 102 through radio wave signals. In particular, radio wave signals 112 transmitted by the transceiver 110 are received by a transmitting and receiving antenna 114 of the wireless headset interface unit 102, and radio wave signals 116 transmitted by the transmitting and receiving antenna 112 are received by

the transceiver 110 of the wireless headset 100. Alternatively, the on/off button 104 may be positioned on the wireless headset interface unit 102.

A power source 122, such as a battery, is positioned within the wireless headset interface unit 102 to supply power to the wireless headset interface unit 102. The transmitting and receiving antenna 114 is electrically connected to transmitter circuitry 118 and receiver circuitry 120. The transmitter circuitry 118 is electrically connected to speech network circuitry 124 through an audio output line 126. The receiver circuitry 120 is electrically connected to the speech network circuitry 124 through an audio input line 128. The receiver circuitry 120 is also electrically connected to a data detector 130 through a data line 132. An off-hook element 134 is connected to the data detector 130 through a control line 136. The off-hook element 134 is also connected to the speech network circuitry 124 through an internal line 138. An I/O device 140, such as a conventional telephone jack, is connected to the off-hook element 134 through an internal line 142. As with the wired headset and headset interface unit illustrated in Fig. 1, a first cord 70 connects the I/O device 140 to a three way-coupler 72. A second cord 74 connects the three-way coupler 72 to a conventional telephone 76 having a handset 78 located on a cradle area 79. By this arrangement, the three-way coupler 72 connects the telephone 76 and the wireless headset interface unit 102 to a telephone jack 80 that, in turn, is connected to a communication line 82.

During normal operation, the user receives an incoming call by removing the handset 78 from the cradle area 79 on the phone 76 and communicating through the handset 78. During "hands-free" operation, the user receives an incoming call by positioning the wireless headset 100 on his head and actuating the on/off button 104. In response to being turned on, the wireless headset 100 transmits an "enable" signal through the transceiver 110. The "enable" signal is received by the receiver

circuitry 120 through the antenna 114. In response to receipt of the "enable" signal, the receiver circuitry 120 generates a data signal over data line 132. When the data detector 130 detects the data signal on data line 132 the data detector 130 transmits a control signal over the control line 136. The control signal causes the off-hook element 134 to go off-hook, thereby providing an audio signal path between the communication line 82 and the speech network circuitry 124.

After the audio signal pathway has been established, the user can receive incoming audio signals and transmit outgoing audio signals through the wireless headset 100. When receiving incoming audio signals through the wireless headset 100, the incoming audio signals travel from the communication line 82, through the off-hook element 134, and into the speech network circuitry 124. As known by those skilled in the art, the speech network circuitry 124 can modulate incoming audio signals, as required, through amplification elements, filter elements and the like. The modulated incoming audio signals then travel to the transmitter circuitry 118 through the audio output line 126. The transmitter circuitry 118 transforms the audio signals into radio wave signals and transmits the radio wave signals through the antenna 114. The transceiver 110 receives the radio wave signals and transforms the radio wave signals into audio signals which are sent to the speaker 108. When transmitting outgoing audio signals through the wireless headset 100, the microphone 106 generates audio signals that are converted to radio wave signals by the transceiver 110. The radio wave signals from the transceiver 110 are received by the receiver circuitry 120 through the antenna 114. The receiver circuitry 120 transforms the radio signals into audio signals and transmits these audio signals to the speech network circuitry 124 through the audio input line 128. As known by those skilled in the art, the speech network circuitry 124 can modulate the incoming audio signals, as required, through amplification elements, filter elements and the like. The modulated audio

signals are then transmitted to the communication line 82 through the off hook element 134, I/O device 140, three-way coupler 72, and telephone jack 80.

When the call is completed, the user may turn off the wireless headset 100 by actuating the on/off button 104. In response to being turned off, the wireless headset 100 transmits a "disable" signal through the transceiver 110. The "disable" signal is received by the receiver circuitry 120 through the antenna 114. In response to receipt of the "disable" signal, the receiver circuitry 120 generates a data signal over data line 132. When the data detector 130 detects the data signal on data line 132 the data detector 130 transmits a control signal over the control line 136. The control signal causes the off-hook element 134 to go on-hook, thereby breaking the audio signal path between the communication line 82 and the speech network circuitry 124. A keypad (not shown) may be provided on the headset interface unit 102 so the user can make an outgoing call through the wireless headset 100. To make the outgoing call the user actuates the on/off button 104 to cause the off-hook element 134 to go off-hook thereby establishing an audible pathway between the wireless headset 100 and communication line 82. The user then dials the outgoing number via the keypad (not shown). If no keypad is provided, the user may actuate the on/off button 104 and remove the handset 78 from the cradle area 79. The user may then dial the outgoing number via the telephone keypad 78a. After the outgoing call is connected, the user may return the handset 78 to the cradle area 79 and continue the conversation via the wireless headset 100. Alternatively, the user can actuate both the on/off button 104 and a speaker button 79a, and then dial the outgoing number via the telephone keypad 78a. After the outgoing call is connected, the user may actuate the speaker button 79a again and continue the conversation via the wireless headset 100.

Referring now to Fig. 4, a voice-recognition headset 150 and a voice-recognition headset interface unit 152 of the present invention are shown. The voice-recognition headset 150 includes a microphone 154, an on/off button 155, and a speaker 156. Alternatively, the on/off button 155 may be positioned on the voice-recognition interface unit 152. The voice-recognition headset 150 is operatively connected to the voice-recognition headset interface unit 152 through a cord 158 having a connector that mates with a stereo jack 160 in the voice-recognition headset interface unit 152. The stereo jack 160 has three connections to three conductors connected to speech network circuitry 162. A first conductor 164 is connected to the ground of the voice-recognition headset interface unit 152. A second conductor 166 connects the microphone 154 in the voice-recognition headset 150 to the speech network circuitry 162. A third conductor 168 connects the speaker 156 in the voice-recognition headset 150 to the speech network circuitry 162. A speech recognition and synthesis module 170 is connected to the speech network circuitry 162 by an audio input line 172 and a dual-tone-multi-frequency ("DTMF") line 174. The speech recognition and synthesis module 170 allows the voice-recognition headset interface unit 152 to detect a simple set of spoken commands from a user. The simple set of commands may include, inter alia, the digits "0" through "9" and the commands "dial" and "end". The speech recognition and synthesis module 170 may also recognize the commands "enable" and "disable". The speech recognition and synthesis module 170 may also permit a user to store numbers corresponding to names stored in a memory. By this arrangement, the user can prompt the speech recognition and synthesis module 170 to dial frequently-called telephone numbers by speaking a name store in memory. This voice recognition capability allows the speech recognition and synthesis module 170 to receive spoken phone numbers and transmit DTMF signals representing the spoken phone numbers. An off-hook element 176 is

electrically connected to the speech recognition and synthesis module 170 through a control line 178. The off-hook element 176 is also electrically connected to the speech network circuitry 162 through an internal line 180. An I/O device 182, such as a conventional jack, is connected to the off-hook element 176 through an internal line 184. As with the wired headset and headset interface unit illustrated in Fig. 1, a first cord 70 connects the I/O device 182 to a three way-coupler 72. A second cord 74 connects the three-way coupler 72 to a conventional telephone 76 having a handset 78 located on a cradle area 79. By this arrangement, the three-way coupler 72 connects the telephone 76 and the voice-recognition headset interface unit 152 to a telephone jack 80 that, in turn, is connected to a communication line 82.

During normal operation, the user receives an incoming call by removing the handset 78 from the cradle area 79 on the phone 76 and communicating through the handset 78. The user transmits an outgoing call by removing the handset 78 from the cradle area 79 on the phone 76 and dialing an outgoing number on a keypad 78a. Once the outgoing connection is made the user communicates through the handset 78.

During "hands-free" operation, the user may receive an incoming call by positioning the voice-recognition headset 150 on his head and actuating the on/off button 155 as set forth in the discussion of FIG. 2.

Alternatively, if the speech recognition and synthesis module 170 recognizes the "enable" command, the user may activate the voice-recognition headset 150 by saying the word "enable". The audio signal representing the word "enable" is generated by the microphone 154 and is transmitted to the speech network circuitry 162 through the cord 158. As known by those skilled in the art, the speech network circuitry 162 can modulate incoming audio signals, as required, through amplification elements, filter elements and the like. The modulated audio signal, representing the word "enable", is transmitted from the speech network

circuitry 162 to the speech recognition and synthesis module 170 through the audio input line 172. In response to receipt of the modulated audio signal, the speech recognition and synthesis module 170 transmits a control signal over the control line 178 to place the off-hook element 176 in the off-hook position. When the off-hook element 176 is in the off-hook position an audio signal pathway is established between the communication line 82 and the voice-recognition headset 150. The audio signal pathway extends from the communication line 82, through the telephone jack 80, three-way coupler 72, I/O device 182, off-hook element 176, and speech network circuitry 162, and to the voice-recognition headset 150. By this arrangement, the incoming call can be received by the voice-recognition headset 150 through the voice-recognition headset interface unit 152.

During "hands-free" operation, the user may place an outgoing call by positioning the voice-recognition headset 150 on his head, actuating the on/off button 155, and saying the word "dial" followed by a string of spoken numbers representing the destination number of the outgoing call. After completing the string of numbers the user says the word "end". Alternatively, if the speech recognition and synthesis module 170 recognizes the "enable" command, the user may place an outgoing call by positioning the voice-recognition headset 150 on his head and saying the words "enable" and "dial" followed by a string of spoken numbers representing the destination number of the outgoing call. As previously discussed, the word "enable" establishes an audio signal pathway between the voice activated headset 150 and the communication line 82.

An audio signal representing the word "dial" is generated by the microphone 154 and is transmitted to the speech network circuitry 162 through the cord 158. As known by those skilled in the art, the speech network circuitry 162 can modulate incoming audio signals, as required, through amplification elements, filter elements and the like. The modulated "dial" signal is transmitted from the speech network circuitry 162 to the

speech recognition and synthesis module 170 through the audio input line 172. In response to receipt of the modulated "dial" signal, the speech recognition and synthesis module 170 enables the DTMF line 174. As known by those skilled in the art, the speech recognition and synthesis module 170 may also check and/or set the states of internal busses, registers, and the like, in response to receipt of the "dial" signal.

Audio signals representing the spoken string of numbers are generated by the microphone 154 and are transmitted to the speech network circuitry 162 through the cord 158. The speech network circuitry 162 modulates the incoming audio signals and transmits the modulated audio signals to the speech recognition and synthesis module 170 through the audio input line 172. In response to receipt of the modulated "number" signals, the speech recognition and synthesis module 170 transmits a string of DTMF signals, representing the string of spoken numbers, to the speech network circuitry 162 over the DTMF line 174. The speech network circuitry 162 then transmits the DTMF signals to the communication line 82 through the off-hook element 176, I/O device 182, three-way coupler 72, and telephone jack 80.

An audio signal representing the word "end" is generated by the microphone 154 and is transmitted to the speech network circuitry 162 through the cord 158. The speech network circuitry 162 modulates the end "signal" and transmits the modulated "end" signal to the speech recognition and synthesis module 170 through the audio input line 172. In response to receipt of the modulated "end" signal, the speech recognition and synthesis module 170 disables DTMF line 174 until receipt of a subsequent "dial" signal.

When the incoming or outgoing call is completed, the user may disconnect the voice-recognition headset 150 from the communication line 82 by actuating the on/off button 155. Alternatively, if the speech recognition and synthesis module 170 recognizes the "disable" command,

the user may disconnect the voice-recognition headset 150 by saying the word "disable". An audio signal representing the word "disable" is generated by the microphone 154 and is transmitted to the speech network circuitry 162 through the cord 158. The speech network circuitry 162 modulates the incoming "disable" signal and transmits the modulated "disable" signal to the speech recognition and synthesis module 170 through the audio input line 172. In response to receipt of the modulated "disable" signal, the speech recognition and synthesis module 170 transmits a control signal over the control line 178 to place the off-hook element 176 in the on-hook position. When the off-hook element 176 is in the on-hook position the audio signal pathway between the communication line 82 and the voice-recognition headset 150 is broken.

Referring now to Fig. 5, a voice-recognition wireless headset 200 and a voice-recognition wireless headset interface unit 202 of the present invention are shown. The headset 200 includes an on/off button 204, a microphone 206, a speaker 208, and a transceiver 210. Alternatively, the on/off button 204 may be positioned on the wireless headset interface unit 202. The headset 200 remotely communicates with the wireless headset interface unit 202 through radio wave signals. In particular, radio wave signals 212 transmitted by the transceiver 210 are received by a transmitting and receiving antenna 214 of the wireless headset interface unit 202, and radio wave signals 216 transmitted by the transmitting and receiving antenna 214 are received by the transceiver 210 of the wireless headset 200.

A power source 222, such as a battery, is positioned within the wireless headset interface unit 202 to supply power to the wireless headset interface unit 202. The transmitting and receiving antenna 214 is electrically connected to transmitter circuitry 218 and receiver circuitry 220. The transmitter circuitry 218 is electrically connected to speech network circuitry 224 through an audio output line 226. The receiver

circuitry 220 is electrically connected to a speech recognition and synthesis module 228 through an audio input line 230. The speech recognition and synthesis module 228 allows the wireless headset interface unit 202 to detect a simple set of spoken commands from a user. The simple set of commands may include, inter alia, the digits "0" through "9", and the commands "dial" and "end". The speech recognition and synthesis module 228 may also recognize the commands "enable" and "disable". The speech recognition and synthesis module 228 may also permit a user to store numbers corresponding to names stored in memory. By this arrangement, the user can prompt the speech recognition module 228 to dial frequently-called telephone numbers by specifying a name that is stored in memory. This voice recognition capability allows the speech recognition and synthesis module 228 to receive spoken phone numbers and transmit DTMF signals representing the spoken phone numbers. The speech recognition and synthesis module 228 is coupled to the speech network circuitry 224 through a DTMF line 238 and a bypass line 240. An off-hook element 232 is electrically connected to the speech recognition and synthesis module 228 through a control line 234. The off-hook element 232 is also electrically connected to the speech network circuitry 224 through an internal line 236. An I/O device 242, such as a conventional jack, is connected to the off-hook element 232 through an internal line 244. As with the wired headset and headset interface unit illustrated in Fig. 1, a first cord 70 connects the I/O device 242 to a three way-coupler 72. A second cord 74 connects the three-way coupler 72 to a conventional telephone 76 having a handset 78 located on a cradle area 79. By this arrangement, the three-way coupler 72 connects the telephone 76 and the wireless headset interface unit 202 to a telephone jack 80 that, in turn, is connected to a communication line 82.

During normal operation, the user receives an incoming call by removing the handset 78 from the cradle area 79 on the phone 76 and

communicating through the handset 78. The user transmits an outgoing call by removing the handset 78 from the cradle area 79 on the phone 76 and dialing an outgoing number on a keypad (not shown). Once the outgoing connection is made the user communicates through the handset 78.

During "hands-free" operation, the user may receive an incoming call by positioning the headset 200 on his head and actuating the on/off button 204 as set forth in the discussion of FIG. 3.

Alternatively, if the speech recognition and synthesis module 228 recognizes the "enable" command, the user may activate the voice-recognition wireless headset 200 by positioning the headset 200 on his head and speaking the word "enable". An audio signal representing the word "enable" is generated by the microphone 206. After the audio signal is transformed into a radio wave signal by the transceiver 210, the transceiver 210 transmits the radio wave "enable" signal from the headset 200 to the antenna 214 of the headset interface unit 202. The radio wave "enable" signal is received by the receiver circuitry 220 from the antenna 214. The receiver circuitry 220 transforms the radio wave signal to an audio signal and transmits the audio "enable" signal to the speech recognition and synthesis module 228 through the audio input line 230. In response to a receipt of the audio "enable" signal, the speech recognition module 228 transmits a control signal to the off-hook element 232 via the control line 234. The off-hook element 234 goes off-hook in response to the control signal. When the off-hook element is in the off-hook position two audible pathways are established between the communication line 82 and the headset 200. The first audible pathway extends from the communication line 82, through the telephone jack 80, three-way coupler 72, I/O device 242, off-hook element 232, speech network circuitry 224, transmitter circuitry 218, antenna 214, and transceiver 210, and into the speaker 208 of the headset 200. The second audible pathway extends

from the microphone 206 of the headset 200, through the transceiver 210, antenna 214, receiver circuitry 220, speech recognition and synthesis module 228, speech network circuitry 224, off-hook element 232, I/O device 242, three-way coupler 72 and telephone jack 80, and into the communication line 82. By this arrangement, the user can receive the incoming call and communicate to the caller through the headset 200 and the headset interface unit 202.

During "hands-free" operation, the user may place an outgoing call by positioning the headset 200 on his head, actuating the on/off button 204, and saying the command "dial" followed by a string of spoken numbers representing the destination phone number of the outgoing call. After completing the string of numbers the user says the command "end". Alternatively, if the speech recognition and synthesis module 228 recognizes the "enable" command, the user may place an outgoing call by positioning the headset 200 on his head and saying the commands "enable" and "dial" followed by a string of spoken numbers and the command "end". As previously discussed, the word "enable" establishes a pair of audio signal pathways between the headset 200 and the communication line 82.

An audio signal representing the word "dial" is generated by the microphone 206. After the audio signal is transformed into a radio wave signal by the transceiver 210, the transceiver 210 transmits the "dial" radio wave signal from the headset 200 to the antenna 214 of the headset interface unit 202. The "dial" radio wave signal is received by the receiver circuitry 220 from the antenna 214. The receiver circuitry 220 transforms the radio wave signal into an audio signal and transmits the audio "dial" signal to the speech recognition and synthesis module 228 through the audio input line 230. In response to a receipt of the "dial" audio signal, the speech recognition and synthesis module 228 enables the DTMF line 238. As known by those skilled in the art, the speech recognition and synthesis

module 228 may also check and/or set the states of internal busses, registers, and the like, after receiving the "dial" signal.

Audio signals, representing the spoken string of numbers, are generated by the microphone 206. After the audio signals are transformed into radio wave signals by the transceiver 210, the transceiver 210 transmits the "phone number" radio wave signals from the headset 200 to the antenna 214 of the headset interface unit 202. The "phone number" radio wave signals are received by the receiver circuitry 220 from the antenna 214. The receiver circuitry 220 transforms the radio wave signals into audio signals and transmits the "phone number" audio signals to the speech recognition and synthesis module 228 through the audio input line 230. In response to a receipt of the "phone number" audio signals, the speech recognition and synthesis module 228 transmits a string of DTMF signals, representing the string of spoken numbers, to the speech network circuitry 224 over the enabled DTMF line 238. The speech network circuitry 224 then transmits the DTMF signals to the communication line 82 through the off-hook element 232, I/O device 242, three-way coupler 72, and telephone jack 80.

An audio signal representing the word "end" is generated by the microphone 206. After the audio signal is transformed into a radio wave signal by the transceiver 210, the transceiver 210 transmits the "end" radio wave signal from the headset 200 to the antenna 214 of the headset interface unit 202. The "end" radio wave signal is received by the receiver circuitry 220 from the antenna 214. The receiver circuitry 220 transforms the radio wave signal into an audio signal and transmits the "end" audio signal to the speech recognition and synthesis module 228 through the audio input line 230. In response to a receipt of the "end" audio signal, the speech recognition and synthesis module 228 disables the DTMF line 238 until receipt of a subsequent "dial" signal. All further signals, representing the user's portion of an ongoing conversation, enter the speech recognition

and synthesis module 228 through the audio input line 230, and exit the speech recognition and synthesis module 228 through the bypass line 240. The bypass line 240 allows signals having no particular meaning to the speech recognition and synthesis module 228 (unlike the enable, disable and phone number signals) to bypass the DTMF line 238 and DTMF circuitry within the speech recognition module 228.

When the incoming or outgoing call is completed the user may disconnect the headset 200 from the communication line 82 by actuating the on/off button 204. Alternatively, if the speech recognition and synthesis module 228 recognizes the "disable" command, the user may disconnect the voice recognition headset by saying the word "disable". An audio signal representing the word "disable" is generated by the microphone 206. After the audio signal is transformed into a radio wave signal by the transceiver 210, the transceiver 210 transmits the radio wave "disable" signal from the headset 200 to the antenna 214 of the headset interface unit 202. The radio wave "disable" signal is received by the receiver circuitry 220 from the antenna 214. The receiver circuitry 220 transforms the radio wave signal to an audio signal and transmits the audio "disable" signal to the speech recognition and synthesis module 228 through the audio input line 230. In response to a receipt of the audio "disable" signal, the speech recognition and synthesis module 228 transmits a control signal to the off-hook element 232 via the control line 234. The off-hook element 234 goes on-hook in response to the control signal. When the off-hook element 232 is in the on-hook position both audio signal pathways between the communication line 82 and the headset 200 are broken.

Referring now to Fig. 6, a preferred embodiment of the headset interface units illustrated in Figs. 2-5 is shown. In the preferred embodiment, the telephone 76 is connected to the communication line 82 through the headset interface unit 250. More particularly, an internal

coupler 252 is connected to the telephone 76 via the second cord 74 and is connected to the communication line 82 via the first cord 70 and the telephone jack 80. The internal coupler 252 is also electrically connected to any internal communication circuitry provided in the headset interface unit 250 (e.g., speech network circuitry). By this arrangement, both the telephone headset interface 250 and the telephone 76 can be connected to the communication line 82 without utilizing the three-way coupler 72 shown in Figs. 2-5.

A general description of the apparatus and method of the present invention as well as preferred embodiments of both has been set forth above. One skilled in the art will recognize and be able to practice many changes in many aspects of the apparatus and method described above, including variations which fall within the teachings of this invention. The spirit and scope of the invention should be limited only as set forth in the claims that follow.

CLAIMS

What is claimed is:

1. A telephone headset configuration for use with a telephone handset, said telephone headset configuration comprising:

a telephone headset; and

a telephone headset interface unit coupling said telephone headset and said telephone handset to a telephone communication line such that a user can selectively operate one of said telephone headset and said telephone handset to receive and transmit a plurality of calls over said telephone communication line.

2. The telephone headset configuration of claim 1 wherein said telephone headset is a wired telephone headset that communicates with said telephone headset interface unit through audible signals carried by a telephone wire interconnecting said telephone headset and said telephone headset interface unit.

3. The telephone headset configuration of claim 1 wherein said telephone headset is a wireless telephone headset that communicates with said telephone headset interface unit through radio wave signals.

4. The telephone headset configuration of claim 1 wherein said telephone headset is voice activated such that said user can receive and transmit said plurality of calls through said telephone headset by operating said telephone headset solely with said user's voice.

5. The telephone headset configuration of claim 1 wherein said telephone interface unit includes:

an off-hook element positioned in an audible pathway that extends between said telephone headset and said telephone communication line, said off-hook element transitioning between an off-hook state and an on-hook state in response to receipt of a plurality of signals from said telephone headset, said off-hook element permitting communication between said telephone headset and said telephone communication line when said off-hook element is in said off-hook state, said off-hook element prohibiting communication between said telephone headset and said telephone communication line when said off-hook element is in said on-hook state.

6. The telephone headset configuration of claim 5 wherein said plurality of signals include at least one of an enable signal and a disable signal;

said off-hook element entering said off-hook state in response to receipt of said enable signal; and

said off-hook element entering said on-hook state in response to receipt of said disable signal.

7. The telephone headset configuration of claim 1 wherein said telephone interface unit includes:

a speech recognition module positioned in an audible pathway that extends between said telephone headset and said telephone communication line, said speech recognition module transmitting a plurality of signals in response to receipt of a series of audible signals representing said user's voice; and

an off-hook element positioned in said audible pathway between said speech recognition module and said telephone communication line, said off-hook element transitioning between an off-hook state and an on-hook state in response to receipt of said plurality of signals from said speech recognition module, said off-hook element permitting communication between said telephone headset and said telephone communication line when said off-hook element is in said off-hook state, said off-hook element prohibiting communication between said telephone headset and said telephone communication line when said off-hook element is in said on-hook state.

8. The telephone headset configuration of claim 7 wherein said plurality of signals includes at least one of an enable signal and a disable signal;

said off-hook element entering said off-hook state in response to receipt of said enable signal; and

said off-hook element entering said on-hook state in response to receipt of said disable signal.

9. The telephone headset configuration of claim 2 wherein said telephone headset is voice activated such that said user can receive and transmit said plurality of calls through said telephone headset by operating said telephone headset solely with said user's voice.

10. The telephone headset configuration of claim 3 wherein said telephone headset is voice activated such that said user can receive and transmit said plurality of calls through said telephone headset by operating said telephone headset solely with said user's voice.

11. The telephone headset configuration of claim 2 wherein said telephone interface unit includes:

an off-hook element positioned in an audible pathway that extends between said telephone headset and said telephone communication line, said off-hook element transitioning between an off-hook state and an on-hook state in response to receipt of a plurality of signals from said telephone headset, said off-hook element permitting communication between said telephone headset and said telephone communication line when said off-hook element is in said off-hook state, said off-hook element prohibiting communication between said telephone headset and said telephone communication line when said off-hook element is in said on-hook state.

12. The telephone headset configuration of claim 11 wherein said plurality of signals include at least one of an enable signal and a disable signal;

said off-hook element entering said off-hook state in response to receipt of said enable signal; and

said off-hook element entering said on-hook state in response to receipt of said disable signal.

13. The telephone headset configuration of claim 3 wherein said telephone interface unit includes:

an off-hook element positioned in an audible pathway that extends between said telephone headset and said telephone communication line, said off-hook element transitioning between an off-hook state and an on-hook state in response to receipt of a plurality of signals from said telephone headset, said off-hook element permitting communication between said telephone headset and said telephone communication line when said off-hook element is in said off-hook state, said off-hook element prohibiting communication between said telephone headset and said telephone communication line when said off-hook element is in said on-hook state.

14. The telephone headset configuration of claim 13 wherein said plurality of signals include at least one of an enable signal and a disable signal;

said off-hook element entering said off-hook state in response to receipt of said enable signal; and

said off-hook element entering said on-hook state in response to receipt of said disable signal.

15. The telephone headset configuration of claim 2 wherein said telephone interface unit includes:

a speech recognition module positioned in an audible pathway that extends between said telephone headset and said telephone communication line, said speech recognition module transmitting a plurality of signals in response to receipt of a series of audible signals representing said user's voice; and

an off-hook element positioned in said audible pathway between said speech recognition module and said telephone communication line, said off-hook element transitioning between an off-hook state and an on-hook state in response to receipt of said plurality of signals from said speech recognition module, said off-hook element permitting communication between said telephone headset and said telephone communication line when said off-hook element is in said off-hook state, said off-hook element prohibiting communication between said telephone headset and said telephone communication line when said off-hook element is in said on-hook state.

16. The telephone headset configuration of claim 15 wherein said plurality of signals includes at least one of an enable signal and a disable signal;

said off-hook element entering said off-hook state in response to receipt of said enable signal; and

said off-hook element entering said on-hook state in response to receipt of said disable signal.

17. The telephone headset configuration of claim 3 wherein said telephone interface unit includes:

a speech recognition module positioned in an audible pathway that extends between said telephone headset and said telephone communication line, said speech recognition module transmitting a plurality of signals in response to receipt of a series of audible signals representing said user's voice; and

an off-hook element positioned in said audible pathway between said speech recognition module and said telephone communication line, said off-hook element transitioning between an off-hook state and an on-hook state in response to receipt of said plurality of signals from said speech recognition module, said off-

hook element permitting communication between said telephone headset and said telephone communication line when said off-hook element is in said off-hook state, said off-hook element prohibiting communication between said telephone headset and said telephone communication line when said off-hook element is in said on-hook state.

18. The telephone headset configuration of claim 17 wherein said plurality of signals includes at least one of an enable signal and a disable signal;

said off-hook element entering said off-hook state in response to receipt of said enable signal; and

said off-hook element entering said on-hook state in response to receipt of said disable signal.

19. A telephone headset configuration for use with a telephone handset, said telephone headset configuration comprising:

a telephone headset; and

interface means for coupling said telephone headset and said telephone handset to a telephone communication line such that said telephone headset can be operated independently from said telephone handset, said interface means comprising:

a speech recognition means positioned in an audible pathway that extends between said telephone headset and said telephone communication line, said speech recognition means for transmitting a plurality of signals in response to receipt of a series of audible signals representing a user's voice; and

connection means positioned in said audible pathway between said speech recognition means and said telephone communication line, said connection means permitting communication between said telephone headset and said telephone communication line when said connection means is in a connect state, said connection means prohibiting communication between said telephone headset and said telephone communication line when said connection means is in a disconnect state.

20. The telephone headset configuration of claim 19 wherein said connection means transitions between said connect state and said disconnect state in response to receipt of said plurality of signals from said speech recognition means, previously a limitation within claim 19.

21. The telephone headset configuration of claim 20 wherein said plurality of signals includes at least one of an connect signal and a disconnect signal;

said connection means entering said connect state in response to receipt of said connect signal; and

said connection means entering said disconnect state in response to receipt of said disconnect signal.

22. The telephone headset configuration of claim 19 wherein said connection means transitions between said connect state and said disconnect state in response to said user manually actuating a telephone headset activation switch.

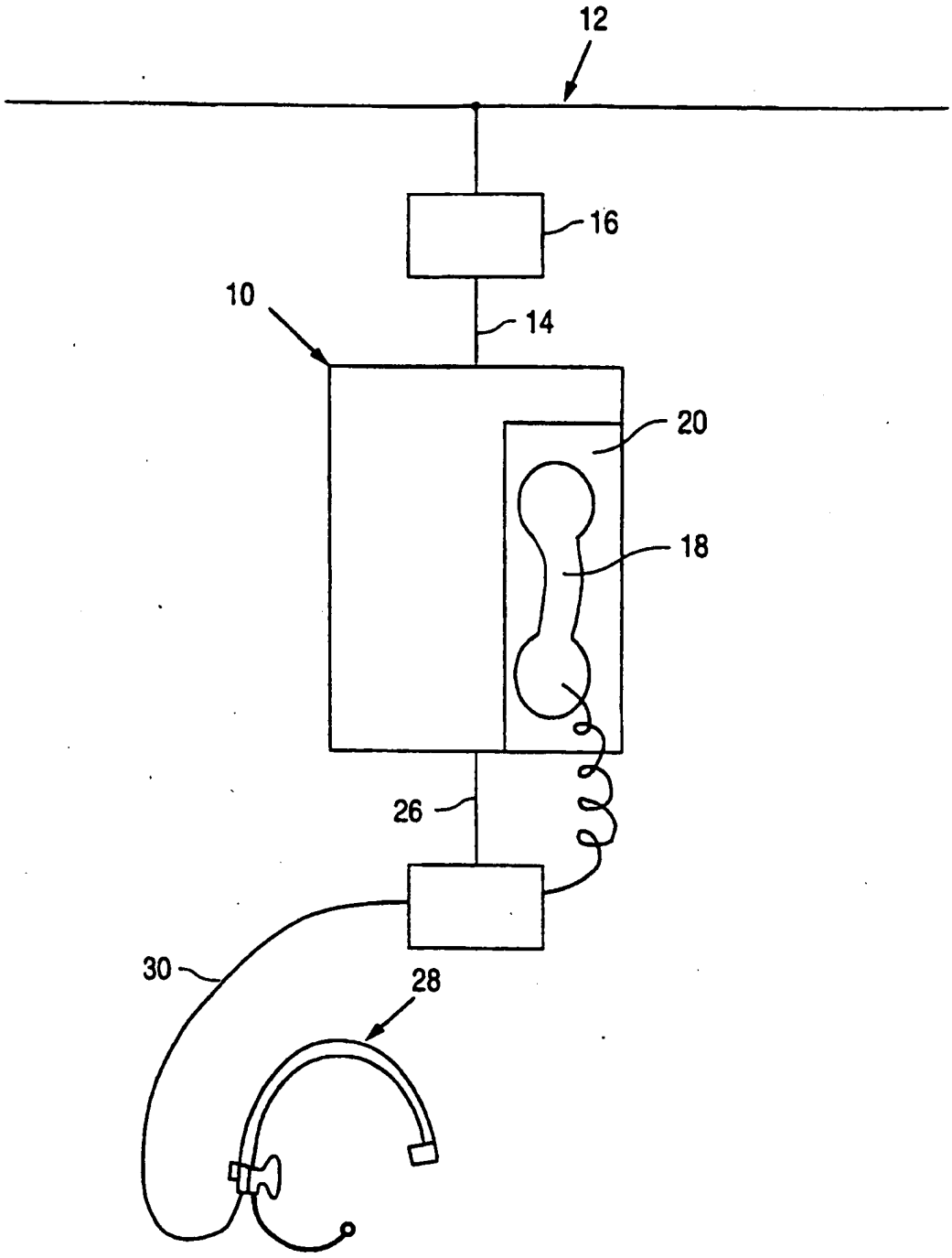


FIG. 1
(PRIOR ART)

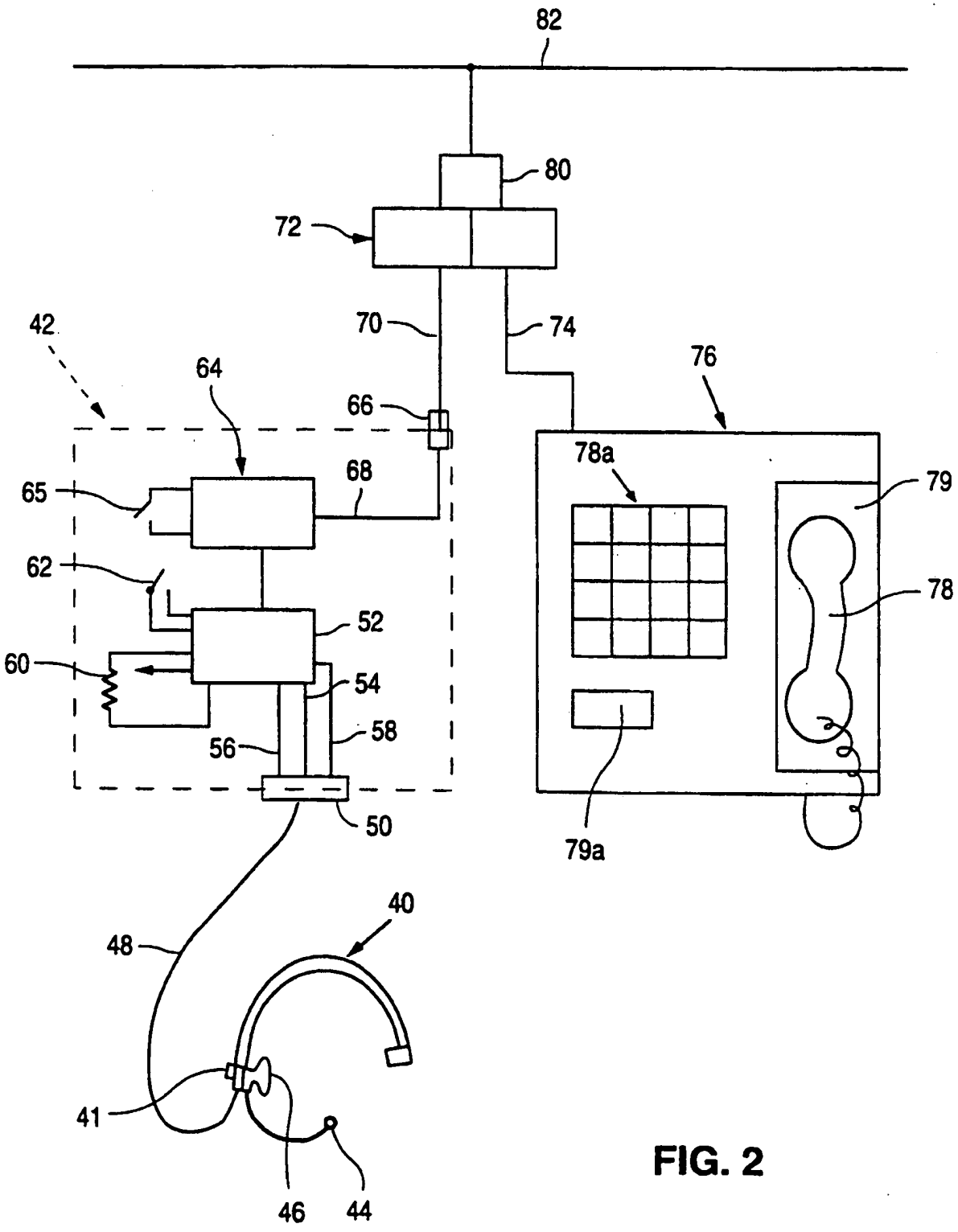

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FIG. 2

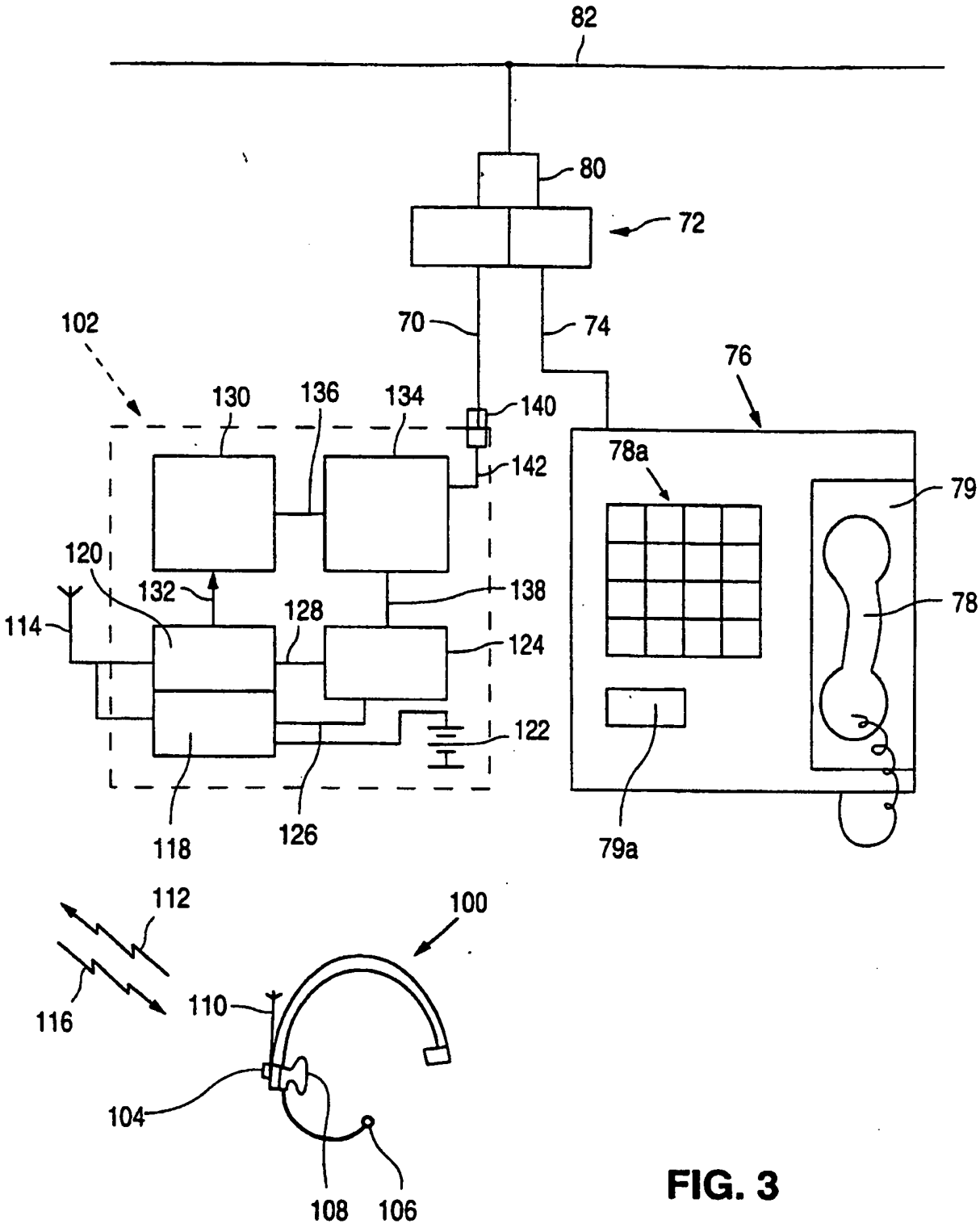
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FIG. 3

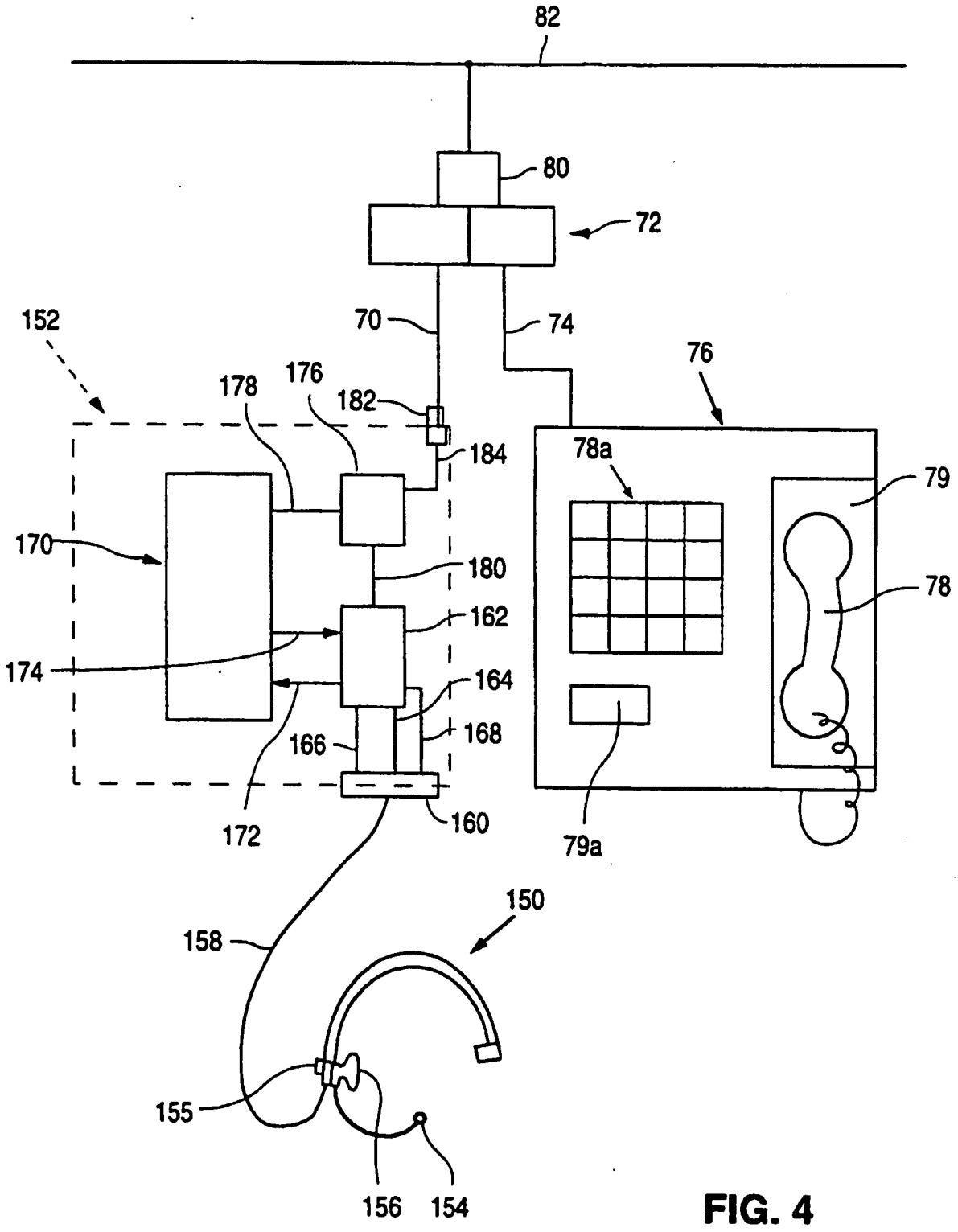
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FIG. 4

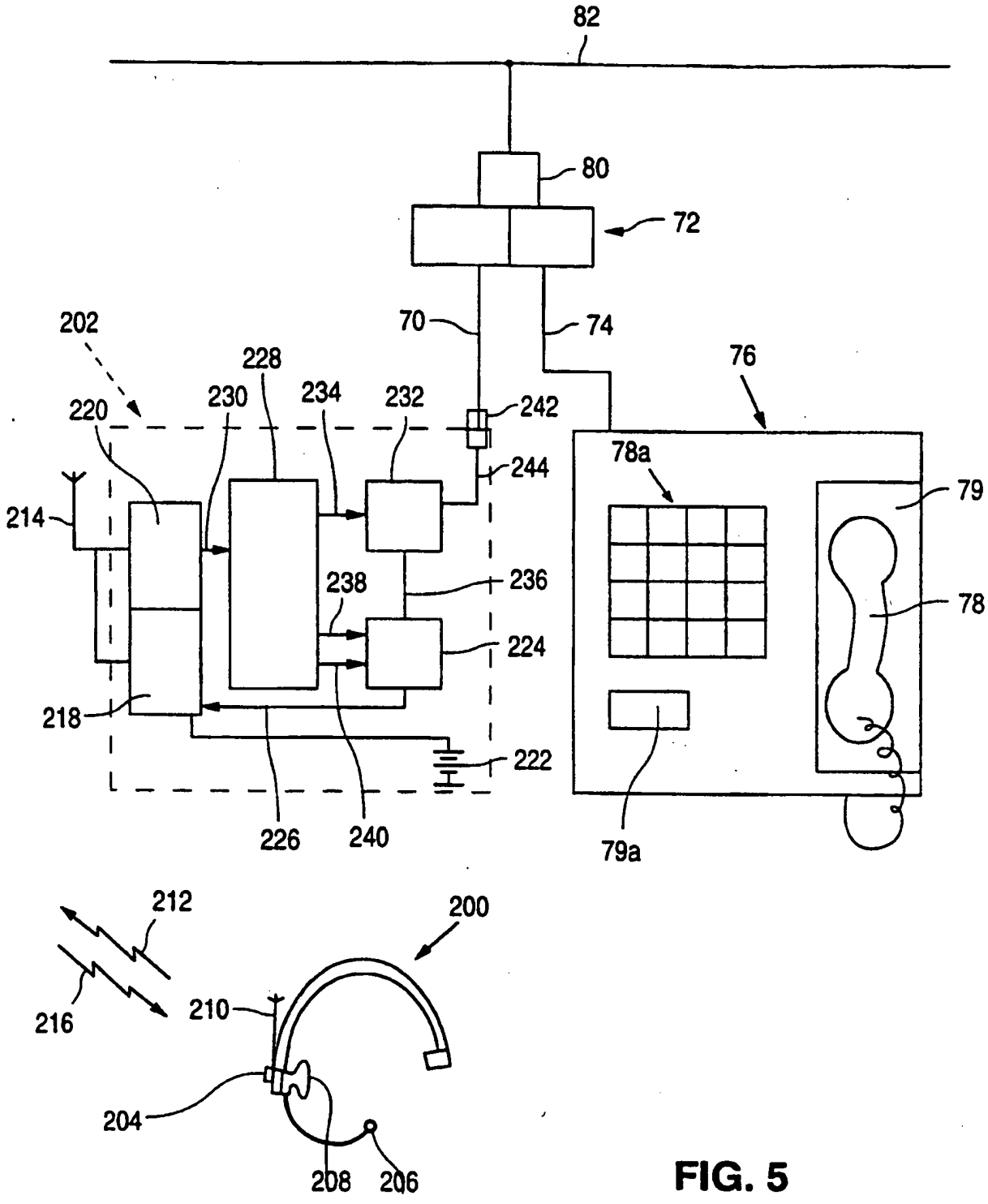
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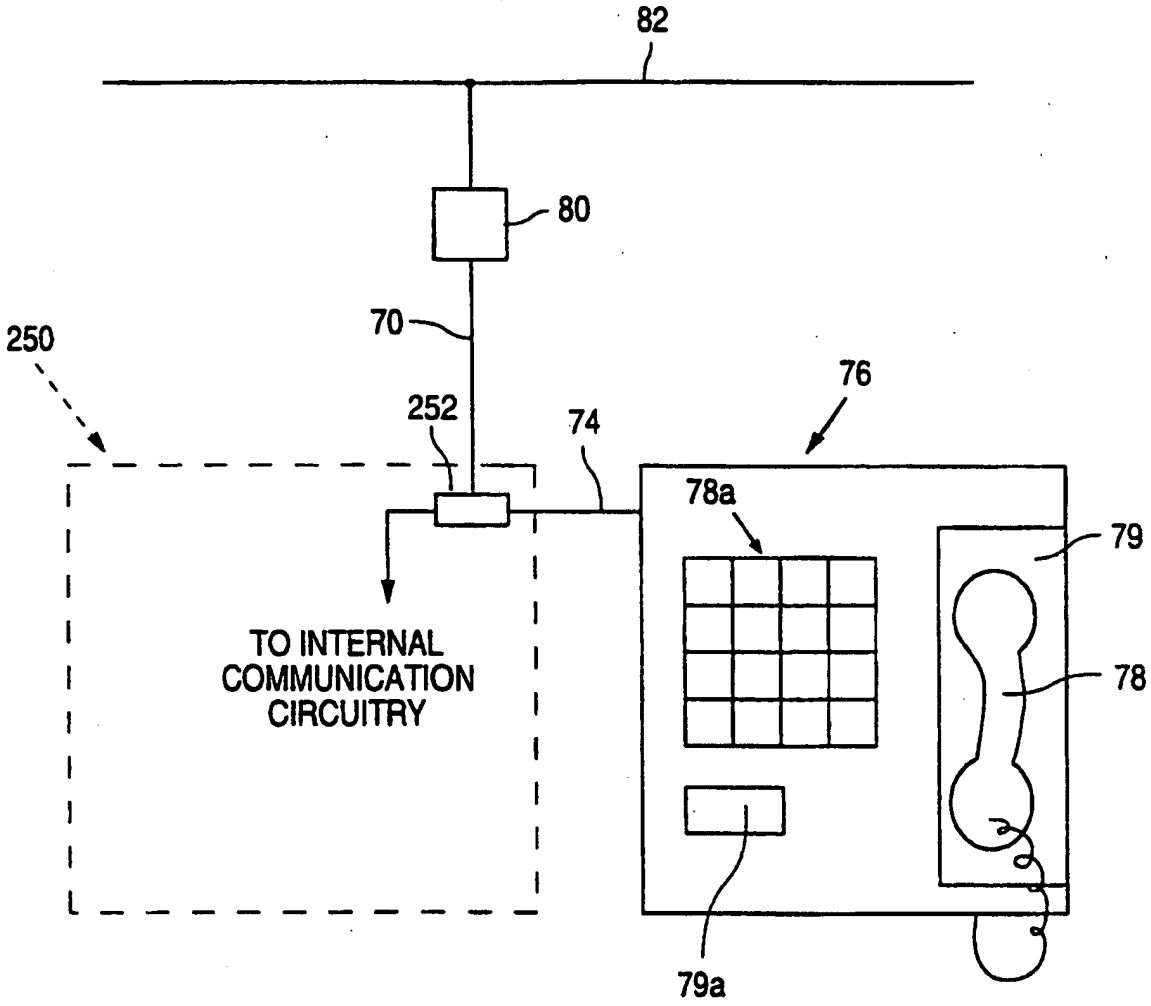
FIG. 5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TO INTERNAL
COMMUNICATION
CIRCUITRY
79a

FIG. 6

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) :H04M 1/00

US CL :379/430, 420, 428

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 379/430, 420, 428

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

none

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

none

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X --- Y	US 5,694,467 A (YOUNG, III) 02 December 1997, whole document.	1, 4-9, 11-12, 15-16, 19-22, --- 3, 10, 13, 14, 17-18
X --- Y	US 4,362,905 A (ISMAIL) 07 December 1982, col. 2, lines 12-50	1-2, 4-9, 11-12, 15-16, 19-22 --- 3, 10, 13, 14, 17-18
A	US 4,754,484 A (LARKIN et al.) 28 June 1988, col. 3, lines, 5-24.	1-19

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

*	Special categories of cited documents:	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A"	document defining the general state of the art which is not considered to be of particular relevance	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E"	earlier document published on or after the international filing date	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&"	document member of the same patent family
"O"	document referring to an oral disclosure, use, exhibition or other means		
"P"	document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search 25 JULY 2000	Date of mailing of the international search report 11 AUG 2000
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-3230	Authorized officer JACK CHIANG Telephone No. (703) 305-4728

Form PCT/ISA/210 (second sheet) (July 1998) *